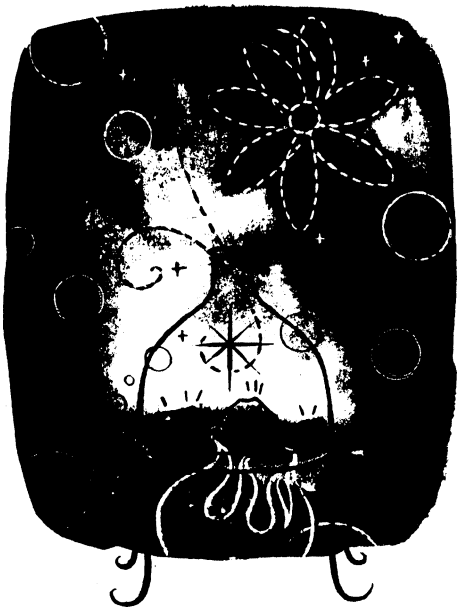

Mini Midases

One scientist finds microorganisms that can pull gold out of water, a discovery rich in possibilities.

IN A COLLECTION OF laboratory bottles, Derek Lovely has watched tiny organisms breathe gold.

Lovely, chairman of the microbiology department at the University of Massachusetts at Amherst, has long been interested in microorganisms known as extremophiles - lovers, as their name suggests, of extreme conditions.

Biologists have been finding that these creatures are able to sustain themselves in environments, such as water near its boiling point, where life was once thought impossible.

Now, Lovely has made a discovery that might change our understanding of the glittering metal that has sealed marriages and started wars. Some of the world's great gold deposits, Lovely suggests in the July issue of the journal Applied ***and Environmental Mfcro-*** biologr, could be the waste products of ancient micro-organisms

All of life, from humans to the strangest one-celled organisms, depends on chemistry to survive. To fuel its needs, an organism must have some way of drawing energy from its environment.

Plants, which form the bottom of the food chain that we depend on, are able to draw energy from the sun in. a process called photosynthesis. They live off this energy, and other animals live off plants - or off other animals that eat plants.

Thus, high school biology taught us, life on earth begins with the sun.

But over the last few decades, biologists have been discovering life that obtains energy by other means. Some microorganisms, for example, are able to release energy using metals in a chemical process analogous to the one by which animals use oxygen to release energy - that is, breathe.

There is an entire group of organisms, for example, that live on iron, called "iron-reducing microorganisms."

What Lovely wondered is whether these organisms could also interact with gold.

So he placed a batch of the extremophiles in a solution that included dissolved gold. The extremophiles went right to work, Lovely found, changing the gold from a dissolved form to a solid form that floated down, in minute pieces, to the bottom.

Over long periods of time, Lovely posits, microorganisms could draw the gold out of a solution of water, and this slow precipitation could build up, leaving a deposit and perhaps inspiring, millions of years later, a gold rush.

Geologists say that biologists will need to run experiments that more closely mimic the chemical environment the organism would live in, according to Byron Berger, a gold expert and research geologist with the United States Geological Service. The Lovely experiment is just a rough proof of the concept.

But geologists admit that the proposal is not as far-fetched as it may sound. There are gold deposits, thin layers in sedimentary rock, that would seem to fit the profile. And around the earth, there are large iron deposits that are thought to be the work of microorganisms early in the history of the planet. It is suspected that microorganisms have been important characters in the play of earth's history. "They play a very important role," says Berger, "and it's not really well understood."

Lovely is interested in the microorganisms beyond their golden touch, though, because they might be useful in cleaning up environmental messes. When metals are dissolved in water, they can travel great distances, and, if they enter the food chain, they can be deadly. It has proved very difficult, Lovely says, to get the dissolved metals out of the water.

He hopes that teams of microorganisms will be able to turn the metals into a solid form, making them far easier to filter out of the water. He has experimented with microorganisms that could be used to clean up uranium, a deadly poison used in making nuclear warheads.

These strange, tiny creatures have attracted many other scientists, because they may provide insights into the origins of life. Extremophiles have been found on the ocean floor, cloaked in utter darkness, thriving near springs of hot water heated within the earth.

Researchers think that this may be where life was first able to start, and that it only later moved up to discover the sun and photosynthesis. This would have implications for the search for life on other planets in our solar system and beyond.

Lovely and the other scientists who work with these lovers of the extreme are moving closer, slowly, to understanding how the rocks first sprang to life.

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